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174. Proposed by J. M. HOWIE, Professor of Mathematics, The Nebraska State Normal School, Peru, Neb.

Describe a circle which shall pass through a given point and be tangent to two given circles.

\*\*\* Solutions of these problems should be sent to B. F. Finkel not later than Nov. 10.

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### CALCULUS.

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135. Proposed by COOPER D. SCHMITT, M. A., Professor of Mathematics, University of Tennessee, Knoxville, Tenn.

To find the equation of the evolute of the common catenary

$$y = (\frac{1}{2}c)(e^{c/x} + e^{-c/x}).$$

136. Proposed by G. B. M. ZERR, A. M., Ph. D., Professor of Chemistry and Physics, The Temple College, Philadelphia, Pa.

Evaluate the definite integral

$$\int_0^1 \int_0^1 \frac{v^{l-1} u^{m-1} (1-v^n)^{p-1} (1-u^s)^{r-1} dv du}{[bv^n + c(1-v^n)]^{p+l/n} (u^s + a)^{r+m/s}}.$$

137. Proposed by F. P. MATZ, Sc. D., Ph. D., Professor of Mathematics and Astronomy in Defiance College, Defiance, Ohio.

Develop the equation of the curve assumed by the inextensible and revolving skipping rope.

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### MECHANICS.

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124. Proposed by F. P. MATZ, Sc. D., Ph. D., Professor of Mathematics and Astronomy in Defiance College, Defiance, Ohio.

A pendulum-bob, weight= $w$ , is suspended by a perfectly elastic cord, length  $l$ . This pendulum makes  $n$  vibrations *up and down*, through a space of  $2m$  inches while it makes a complete vibration in an arc of  $2\psi$ . Determine the nature of the curve described by the center of the pendulum-bob in making one complete vibration in arc.

125. Proposed by THOMAS U. TAYLOR, C. E., Professor of Civil Engineering, University of Texas, Austin, Texas.

(1) If a parabola is described on the verticle face of a reservoir wall, axis vertical and in the surface, and  $P(h, b)$  be any point on the curve, and  $B$  the foot of the perpendicular from  $P$  on the axis, find c. p. on area  $OBP$ .

(2) If  $A$  is point where horizontal through  $P$  cuts vertical axis ( $OY$ ), find c. p. on area  $OAP$ .

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### DIOPHANTINE ANALYSIS.

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89. Proposed by JOSIAH H. DRUMMOND, LL. D., Portland, Me.

Show that in  $2x^2 + 2y^2 - z^2 = \square \dots (1)$ ,

$$2x^2 + 2z^2 - y^2 = \square \dots (2),$$

$$2y^2 + 2z^2 - x^2 = \square \dots (3),$$

any two numbers and their sum and difference will satisfy the conditions.